Managing Research through Statistics and Demos

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Abstract: I examine how numbers and public demonstrations of technology ("demos") are used to assess, manage and advertise science and technology. My analysis is based on empirical investigations I have conducted over recent years on the management of a European research program in the field of Information Technology. This study shows how the quantification of research activities and the performance of demos have become key tools in the construction of Europe as a political and scientific community. Reflexive uses of both tools are needed as they have major consequences for scientific practice.

Keywords: Statistics, Demos, European Commission, Scientific Policies, Evaluation

Managing Research through Statistics and Demos.

Claude Rosental[1]

Over recent years, the quantification of research activities, and perhaps more surprisingly, the performance of public demonstrations of technology ("demos") have become key elements in defining European research policies and politics and essential tools in European public management of science and technology. In particular, the European Commission has used numbers and demos to assess, manage and advertise its Research and Development (R&D) programs. But while in past years the quantification of research activities for evaluation purposes has generated passionate debates within the scientific community, especially in France, and has sometimes been depicted as a danger for scientific endeavor (Blay 2009), the wide use of demos in Europe for assessment and management purposes and their major impact on scientific practice have remained largely unnoticed and undebated. In order to highlight this impact, compare it to that of numbers, analyze some of the ins and outs of quantification and demo practices and contribute to a proper repositioning of the debates, I analyze the results of empirical investigations I have conducted over recent years on both types of practice within a European research program in the field of Information Technology.

Sociologists and historians have highlighted many uses of statistics in different contexts (especially in relation to state action) that the European Commission partly shares (Brian 1994; Desrosières 1993; Didier 2009). In particular, they have shown how statistical indicators have been used by neo-liberal states since the 1970s as a way to make all kinds of social actors - individuals, firms, administrations - compete with one another (Desrosières 2014). Porter (1995) has also brought to light how institutions and individuals who wish to appear impartial may produce statistics in order to face a lack of trust.

Moreover, studies on the specific uses of statistics in science and technology have unveiled several dynamics that represent important contextual elements for the case under

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study. R&D statistics that have developed in North America and Western Europe since the 1920s have tended to focus on economic aspects and have been used by governments to evaluate state action, guide political decisions, demonstrate competitiveness, and sometimes serve as an argument to invest more money on research (Godin 2005). Whilst in recent years some analysts have criticized a considerable number of improvised, weakly grounded or wrong uses of statistics in the design of science indicators (Gingras 2014), others depict these numbers as part of the technologies used to control, orient and regulate social groups – here, scientific communities – in accordance with the New Public Management doctrine and its principles of accountability (Louvel 2012), and with the current emphasis put on benchmarking used as a tool of government by the European Union (Bruno 2008).

As social scientists have paid far more attention to the uses of quantification than to those of demos (Rosental 2007), the case under study here should help to broaden the picture of new government technologies that have developed in Europe in recent years. Indeed, it brings to light practices that the European Commission has deployed since the 1990s to manage its R&D programs in, and beyond, the Information Technology field. My analysis is based on empirical investigations I have conducted on the management of one of these programs called ACTS ("Advanced Communications Technology and Services"). The ACTS program was managed by the DG XIII (Directorate General for Telecommunications, Information Market and Exploitation of Research) of the European Commission from 1994 to 1998; it was followed by other European programs: "Information Society Technologies" (1998-2006), and "Information and Communication Technologies" (2007-2013).

My investigations of ACTS activities drew on several sources and combined different methods. By the end of the 1990s, I had conducted a series of interviews among ACTS participants in Europe, made some ethnographical observations of a large ACTS meeting in Brussels, and collected various types of textual and multimedia documents. These include a series of ACTS and independent reports, CD-ROMs and brochures produced by ACTS participants and the ACTS program. The list of documents also includes electronic presentations of ACTS projects published in various European online databases, European newsletters and publications, newspaper articles, technical publications of ACTS participants, electronic exchanges between ACTS participants in a specialized forum, and video-clips of public demonstrations of technology.

The main purpose of ACTS was to develop a high-speed communications network in Europe, along with multimedia services. Multimedia applications designed for the high-speed network included software for high-quality videoconferencing. Another purpose of ACTS was to favor telework in Europe. ACTS involved experiments of telework within major industrial firms and participating European institutions. The program selected and funded more than 150 projects over a 5-year period. ACTS' overall budget was around €700 million. Participants in the program included researchers, engineers, and executives from numerous European countries. Many of them worked for telecommunication and computing firms.

ACTS officials had to demonstrate the program's achievements in a specific context. They faced insistent questions, conflicting demands, and criticisms from European Parliament members and industrial lobbies. Lobbying organizations representing different industries sought favorable treatment. ACTS officials had to show that they took many economic and political interests into consideration and that their arbitrations were impartial and relevant. They also had to show that their use of public money led to "concrete" and "valuable" results. They used several devices for such purposes. One was the design of summary reports displaying appropriate statistics on the program. These reports were distributed in Brussels and beyond. Another device was the running of public demonstrations of technology by ACTS participants. These demonstrations and statistics were more particularly intended for economic and political authorities. These included company managers and national and European elected officials.

ACTS reports described the program's activities in a concise way, using lists, tables, charts and figures. They were based on the analysis of closed questionnaires periodically distributed to the participants. These questionnaires and statistics were part of a large communication plan designed by consultants and researchers funded by the ACTS program. These researchers and consultants designed questionnaires and found categories which portrayed ACTS project activities in a favorable light. In the next 2 sections, I focus on the content and uses of ACTS statistics. I then turn to public demonstrations of technology.

Project statistics

In the aforementioned context, an important set of statistics on ACTS projects related to the distribution of European public money to all kinds of actors. They highlighted ACTS officials' concern to produce fair arbitrations and to exclude no-one. Figures showed that ACTS was

subsidizing many European countries and all kinds of industrial activities. Statistics also showed that ACTS funded many European regions and businesses, both small and large. Regional inequality and development and small businesses were important topics for European institutions. Moreover, statistics revealed cross participations of European actors in the ACTS framework – indeed, the European Commission declared that encouraging European cooperation was a major goal.

The ways research activities were quantified helped highlight the accountability of ACTS officers in other ways. They especially showed how the latter made the most of European public money. They portrayed ACTS participants as particularly active, productive and competitive in the world economy. Figures focused on the number of scientific papers, contributions to standards, patents, and experiments produced by the program. Statistics described the types of technological applications being developed, as well as the many different types of test conducted on the experimental network. Figures showed an impressive number of trials being run, for all kinds of purposes and involving huge numbers of participants and users across Europe and industrial fields. The trials were also depicted as contributing to many enhanced or new services.

Impressive figures were put forward. For example, one intermediary report referred to more than 1300 papers that had been published up to that point and to 345 contributions to standards reported by 58 projects alone (ACTS "Results, Impact and Exploitation" Interim Report 1997: 5). Another report evoked twice as many public demonstrations of technology performed by ACTS participants as there were articles published in refereed journals (1996 External Monitoring Report on the ACTS Programme 1997: 40). Quantification is commonly used in social life to homogenize incommensurable phenomena (Espeland 1998). Summing up ACTS participants' activities in the manner I just described resulted in them being portrayed as comparable and cumulative. This way of counting omitted competition between participants, as well as non-cumulative and antagonistic work. For instance, adding up patents produced by the program did not bring to light the fact that the latter might be in a context of war, and that a patent produced by one given group of participants might mean the downfall of another. ACTS activities were thus depicted as homogeneous and converging toward European competitiveness and not as partially countering one another. They were shown as pure sums versus partial subtractions.

Other figures produced on research activities helped emphasize the fact that no time or public money was lost by the participants. In an ACTS report for example, one table was described as follows (ACTS "Results, Impact and Exploitation" Interim Report 1997: 19): "The total man months in the above table amounts to some 22,682+ man/months of effort - this implies that a figure in excess of 55% of the man months funded by the Programme so far has been devoted purely to product development. Remaining man months are of course taken up by such matters as trial support activities, cost-benefit and techno-economic analyses, dissemination actions, inter- and intra-project management (including ACTS chain and domain support) and reporting, and also by the specifically horizontal projects in the Programme."

The picture given of ACTS participants in the reports might be compared to that of ants in an ant hill, or more accurately to Tocqueville's portrayal of democratic societies, in which scientists are expected to be in constant activity and to devote themselves primarily to the development of new technologies that save labor and costs (Tocqueville 2004: 48-50). ACTS statistics actually obsessively stressed the fact that the program produced tangible results and did not subsidize research activities for science's sake. They insisted on the idea that research results were well disseminated and exploited and that the program obtained better results than its predecessor (namely the RACE program). Some tables concerned the participants' "goals" and the "benefits" they drew from ACTS, based on their answers to questionnaires. Comments on such tables depicted research as a somewhat "second-class" activity and as a necessary step towards achieving different types of "ultimate" goals and benefits for participants. Reports distinguished between hard and soft goals and benefits. Hard benefits for participants included product or service development or improvement. Soft benefits included improved scientific reputation and "scientific performance", as well as increased contract research. The "dissemination of results through published papers" was also described as an example of a soft goal (ACTS "Results, Impact and Exploitation" Interim Report 1997: 11).

Excuses were almost made for ACTS participants' soft goals and benefits. For example, reports invoked the unavoidable indirect products of science and technology in development. In an intermediary report, statistics on benefits for ACTS participants were thus presented in the table reproduced below (ACTS "Results, Impact and Exploitation" Interim Report 1997: 20):

	Projects	%
Improved corporate image	62	45
Increased number of R&D employees	61	44
New business or research areas	55	40
Improved scientific reputation	52	37
Improved scientific performance	47	34
Increased contract research	43	31
Increased number of technical employees	36	26

This table was commented upon in the following terms (ACTS "Results, Impact and Exploitation" Interim Report 1997: 20): "The top items, mentioned by more than a quarter of all projects, are typical of the consequences of research projects when they are still ongoing - items such as improved scientific reputation and performance, increase in technical staff etc."

Despite the hierarchy of benefits, the spirit of the reports was to valorize as many aspects of the program as possible. So soft benefits (and goals) were valorized in the same way as hard benefits (and goals). Overall, statistics showed that ACTS yielded several types of benefits that were mostly of a socio-economic nature (*ACTS "Results, Impact and Exploitation" Interim Report*. 1997: 16-26): Favoring economic development in Europe, contributing to the competitiveness of European firms, developing the European telecommunications infrastructure and better services for European citizens, improving European cooperation between different institutions across Europe, improving employment in Europe, expanding the level of training of Europeans, addressing ecological concerns, and to a lesser extent, promoting multiculturalism and access to culture.

Advantages and limits of statistics

These statistics had several advantages for ACTS officials. First, they highlighted the latter's accountability. In particular, they showed the fact that officials monitored the results of the program on a periodical basis and in a "professional" way, and that they were "transparent" about them. Numbers were the external signs of serious, systematic, and objective monitoring. In addition, these statistics served as a reservoir of answers to criticisms. When necessary, officials

could mobilize a certain number of favorable figures in the framework of discussions or public answers, and refer to existing reports. In other words, figures and statistics were available and could be used to legitimize ACTS actions. Furthermore, statistics could help European officials adjust their policies and arbitrations. They gave them leeway to adjust or redefine funding priorities, especially if some actors appeared to be disadvantaged at some point.

Statistics had other advantages. Contrary to the masses of technical documents produced by ACTS participants, they were compact and could be easily circulated. Comparatively, they were also more comprehensible to administrative officers, industrialists and political authorities. Tables, charts and calculations were quite basic and familiar to them. Moreover, categories used to assess the impact of the program fitted the language of business people concerned with marketing issues (“corporate image,” “reputation”), employment matters (“number of employees”), market development (“new business areas”), and performance in general (“scientific performance”) – see table above. Overall, statistics possessed many assets with which to convince the various authorities that the ACTS program was productive, useful and fairly managed.

These statistics nevertheless had certain limits. They had to be read, whereas the targeted audiences often appeared to prefer moving pictures to texts, and personal interaction to solitary reading. By comparison, statistics were perceived as not very entertaining, nor good at capturing attention and generating enthusiasm. Moreover, even if figures, charts and tables generally required less time to read than lengthy prose, a certain amount of time was nevertheless needed and might give readers the feeling of requiring more time than attending lively and interactive presentations.

The production of statistics was thus accompanied by other actions. ACTS officials relied on other devices to demonstrate the virtues of the program. Electronic databases were built to display well-prepared abstracts and attractive images of ACTS projects on the Internet. Journalists were given the means of presenting exciting results in European publications. Success stories of ACTS projects were also produced and conveyed via different communication channels, including CD-ROMs. For instance, a CD-ROM entitled "ACTS Multimedia Success Stories" contained short texts accompanied by images and videos, to make the readers’ task easier and more attractive (ACTS Multimedia Success Stories 1996).

Demos

But by far the most important means of demonstrating the achievements of the program consisted in running "demos."[2] Demo is an abbreviation of public demonstration of technology. A demo consists in exhibiting a technological device in action, as in Steve Job's famous demos of Apple products. ACTS demos involved showing the functionality and usefulness of multimedia applications and of high-speed exchanges of information. For example, some demos showed how to view, manipulate and transmit medical image data on the high-speed network.[3] Other demos showed how to practice telework via high-quality videoconferencing.[4] These demos brought together various types of individual, such as executives and managers of telecommunication and computing firms, engineers, researchers, senior EC officials, representatives of lobbying organizations, journalists, and politicians.

Organizing a teleconference involving economic actors and political authorities was a targeted and powerful way for ACTS officials to demonstrate the projects' results to actors concerned with public spending. Because of the demos, these actors were not forced to base their opinions on ACTS' results and future, on expert advice alone, or on reports that challenged their reading skills, or even on series of dry figures. Instead, ACTS demos provided moving pictures and personal interaction. The limited time needed to attend demos offered a unique opportunity for busy officials to apprehend - or at least gain the illusion of apprehending - submitted projects.[5] And those who could not physically attend could still view video clips of selected demos on CD-ROMs advertising the program's results.

Producing a large number of demos using various formats in front of multiple audiences was a powerful means of increasing the visibility of the ACTS program and arguing for its utility. Some ACTS demos were planned from the very start of the program, following a precise four-year schedule. Altogether, ACTS demonstrations of feasibility functioned like demonstrations of strength (Mukerji 1997: 297-299), aiming at exhibiting the reliability of the technologies at

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[2] For further developments on this section and the next two, see Rosental (2013).

[3] http://cordis.europa.eu/infowin/acts/analysys/products/thematic/multimed/document/ccase3.htm. Retrieved: May 29, 2014.

[4] http://cordis.europa.eu/infowin/acts/analysys/products/thematic/multimed/document/ccase8.htm. Retrieved: May 29, 2014.

[5] Evaluations of scientific projects and claims generally occur within a very imperfect economy of time and know-how (Lamont 2009; Rosental 2008). In the framework of this economy, demos are perceived in many cases as an essential tool for the assessment of scientific and technological projects, even though it is based on a mutually agreed upon fiction (Smith 2009).

stake and of the participants. At the same time, demos were tools that could be used to assess the program and its projects and to define future funding policies.

Coordination, competition and exchange dynamics

Yet public demonstrations played roles that statistics did not play. As I have just pointed out, the periodic performance of demonstrations was built into the ACTS timetable. ACTS participants took advantage of this and appropriated the running of demos for their own purposes. Demos helped participants maintain confidence in the work in progress. They also enabled them to generate interest in their project among newly-approached or unknown actors and obtain new contracts or build new partnerships.

Performing demos helped to define and refine the content of ACTS projects in a dialectical manner. Engineers and researchers took seriously the criticisms and suggestions expressed by audiences during demos. As such, demos played a role in influencing the orientation and reorientation of projects. Sometimes, demos were even used as tools for project management when demonstrators observed audiences' reactions in a systematic way and collected ideas in order to define the content of their research step by step.

Demos also contributed to the coordination of ACTS participants. To benefit from EC funding, the latter had to demonstrate collaborative work with European partners. Even if they had competing approaches and interests, which made the collective writing of papers difficult, the preparation of common demos provided a common denominator. But demos were also marked by a concern to hide certain results, as European telecommunication and computer firms were competing with one another. Representatives of these firms were often asked by their higher-ups to keep certain aspects of their work secret during their meetings in Brussels. They arrived in Belgium with sometimes imprecise understandings of what could be said and shown and what should be hidden behind technological black boxes.

Demonstrators negotiated these issues during demo interactions according to how the demonstrations themselves went and the kinds of links that the demonstrators had built in the past or wanted to build in the future with their interlocutors. Providing information was generally more rewarding for the demonstrators than a well-kept secret, especially as it helped them gain information within the framework of exchange processes and as it was often difficult to track down

information leaks. As a result, information gifts and counter-gifts were very much at play. In the context of these dynamics of veiling and unveiling, demos operated more like exchange and secret management tools than proof procedures or instruments of persuasion.

Demos thus played a central role in establishing and structuring relationships and competition between the multiple actors involved in the ACTS program. Demos structured the distribution of credit to individuals, teams, and institutions, as well as to scientific and technological objects. But demos also structured the work of participants, especially when they were used as mechanisms for observing audience reactions, tools for project management, and exchange apparatuses. Their impact was further enhanced by a range of peripheral tools, such as reports and CD-ROMS exhibiting success stories. In other words, demos served as the flagship among a fleet of demonstration devices.

Moreover, the use of demos served many different strategies and agendas. The setting up and performance of ACTS demos met the complementary interests of several types of actor - scholars, engineers, corporate executives, managers, politicians, journalists, administrative officers - and constituted a rare opportunity for interaction, competition, and coordination of action. These actors would probably never have met without such a gathering device. Their exchanges were marked by recourse to spectacular demonstrations similar to those that brought together scholars, entrepreneurs, and representatives of political and religious powers in France and in England in the seventeenth century (Licoppe 1996). At a global level, demos served as a privileged bridge between science, technology, and society.

Public Demonstrations as a Constitutional Topic

The process I have described illuminates why "demonstration activities" were at the heart of the chapter devoted to science and technology in the recent effort to draft a European constitution. In other words, it explains how demonstrations have become a constitutional topic for Europe. The European constitution project states (Treaty Establishing a Constitution for Europe 2004: 109–10):

> The Union shall carry out the following activities, complementing the activities carried out in the Member States: (a) implementation of research, technological development and demonstration programmes, by promoting cooperation with and between undertakings,

> research centres and universities; (b) promotion of cooperation in the field of the Union's research, technological development and demonstration with third countries and international organisations; (c) dissemination and optimisation of the results of activities in the Union's research, technological development and demonstration.

This statement illustrates that managing European R&D programs such as ACTS and enacting effective public demonstrations have become central components of the European political project. It also reveals how European science and technology politics and policies have been defined in recent years in management terms and how demonstration activities have become an essential tool of European public management. As surprising as it may seem, demonstrations based on numbers, and to an even greater extent demos, have become key tools in the construction of Europe as a political and scientific community.

In short, the EC has developed a "demo-cracy"—a regime that uses public demonstrations to manage public affairs. I do not use this expression to mean that the EC has found an efficient way to convene mass audiences across Europe and convince them of the success of its actions;[6] public demonstrations appear to be intended first and foremost for economic and political elites. Instead, I wish to highlight the fact that the EC has mobilized public demonstrations, based in particular on statistics and demos, to administer public affairs in a systematic manner and to define and manage political projects on a large scale.

Demo practices should therefore be considered as an issue which is at least as important as the quantification of research activities.[7] No less than statistics, these practices deserve to be part of current public debates about the appropriate means of assessment, management and advertisement of science and technology. The uses of demos, like those of numbers, involve stakes that should not be undermined by the scientific community.[8]

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[6] As Jasanoff (2005) argues, the types of public demonstration which are credible and persuasive for people vary across European, and other, countries, in relation to their specific civic epistemologies.

[7] This is as true for Europe as for other countries such as the USA which produce huge numbers of demos (Rosental 2007).

[8] I would like to thank the organizers of, and participants in, the "Numbers from the bottom up" workshop held at the Wissenschaftskolleg in Berlin on March 6-7, 2014, as well as Michel Dubois, David Pontille and Emmanuel Schutz for their insightful comments on earlier drafts of this paper.

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